



RAYTHEON

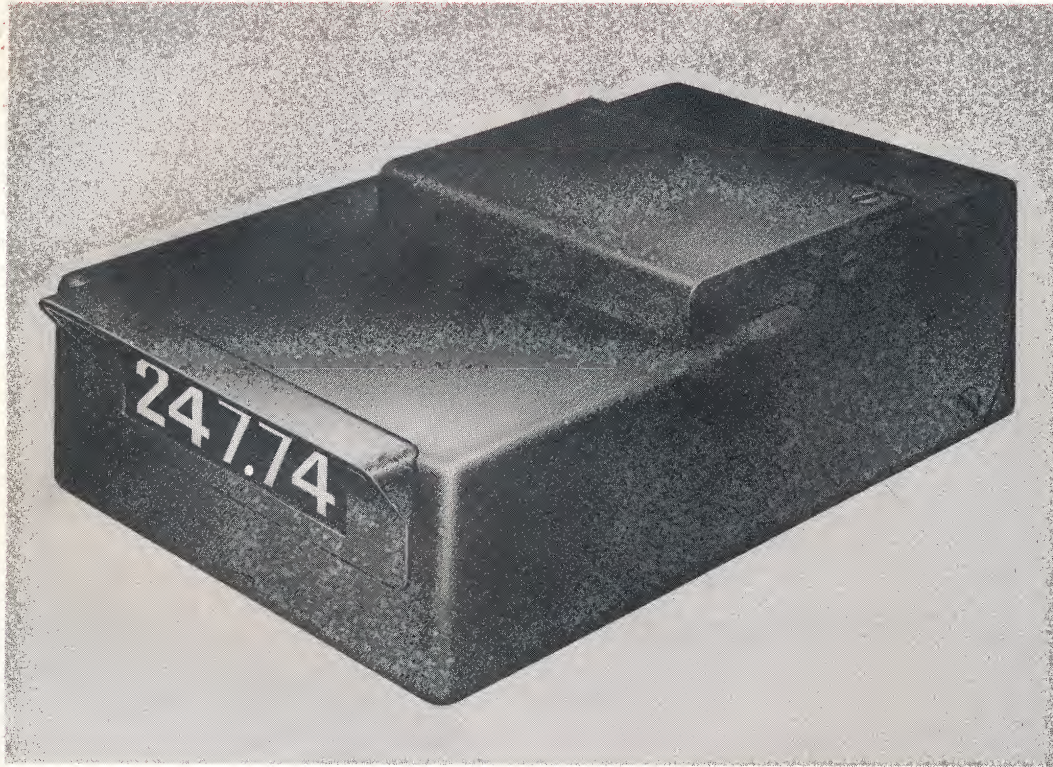
HERE IS

DISPLAY
DEVICES
DATA

FOR YOUR FILE

RAYTHEON

DATASTROBE

**DIGITAL READOUT
SYSTEM**

FEATURES

- **CHARACTERS**
Sharp—Clear
Conventional Shape
White on Black
One Plane
Sizes 1/4 inch to 1 inch
- **ALL SOLID STATE ELECTRONICS**
- **NO AMPLIFIERS REQUIRED**
- **TRUE 4—BIT BCD INPUT**
- **NO DECODERS REQUIRED**
- **FLOATING DECIMAL POINT (optional)**
- **TIME-SHARED SELF SYNCHRONIZED ELECTRONICS**
- **ALPHA-NUMERIC CAPABILITY**
- **IDEAL REMOTE READOUT CAPABILITY**

DESCRIPTION

The Datastrobe system is based on an entirely new principle which makes possible complete multidigit, In Line, In Plane, Readout Systems utilizing a minimum number of components.

The Datastrobe system represents a major breakthrough in the character display field. The single, time-shared, high speed gas strobe tube, encompassed by a continuously rotating cylinder with transparent numbers, replaces as many as 66 incandescent bulbs used in conventional projection displays. An optical system projects brilliant white numbers on the viewing screen against a black background. Operates

directly from 4 bit BCD input using 2 volt signal and 1 milliamp per bit. Systems can be supplied to provide symbols and full alpha-numeric in any number of columns.

Datastrobe's unique, time-shared, all solid state logic with its minimum component count assures maximum system reliability at minimum cost. Switching is faster than the response time of the human eye. In some systems this factor has resulted in the replacement of as many as 10 mechanical type readouts by a single Datastrobe.

SPECIFICATIONS

- Power: 1. Single Phase, 60 cps, 117 Vac
2. 300-420 Vdc (40 mAdc—for 6 digits) (for Flash Tube)
3. Bias +10 Vdc (50 mAdc max for 6 digits)
Bias -10 Vdc (30 mAdc max for 6 digits)

Maximum Transition Time *22 milliseconds

*Time to go from one 6 digit display to a second digit display. Note: inputs may be switched at megacycle rates without limitation by the Datastrobe unit.

MAXIMUM EASE OF INSTALLATION

For a 6 digit unit simply connect 24 parallel outputs (4 bits per digit X6) to the Datastrobe inputs. Connect the 400 V flash tube and trigger power line; connect

PRINCIPLE OF OPERATION

The Datastrobe readout utilizes a single rotating drum in conjunction with a special high speed strobe lamp; time shared, all solid state circuits; and an optical projection system to produce a high clarity, white on black multi-digit display from BCD input signals.

In operation the drum, which has up to 6 columns of characters inscribed on it for each flash tube projection station (see Fig. 1), is rotated continuously at 2500 RPM. The standard Datastrobe accepts up to six columns of parallel, 4 bit BCD information directly from the user's output (see Fig. 2). This information

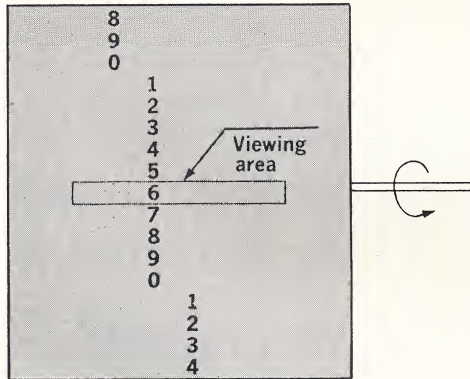


FIG. 1 CHARACTER DRUM

ALL SOLID STATE LOGIC CIRCUITS

The Datastrobe readout has all solid state electronics. No switches, no relays, no slide plates nor other intermittent motion mechanisms are used. No auxiliary

LOWEST SIGNAL POWER

Signal levels required from the user's equipment, for the standard Datastrobe readout unit are 1 = 0V, 0 = $\pm 2V$ to $\pm 13V$. (For a 1 input (0V), maximum current per bit is less than 1 ma when operating with $\pm 10V$ bias. At 0 (positive V) no current is drawn. As

Character Height: 1/4 inch to 1 inch

Nominal Dimensions: Height—3 inches

Width—5 1/8 inches (4 to 6 digits)

Depth is dependent upon viewing system and character size. For straight projection with 1/2 inch characters, depth is approximately 9 1/4 inches.

single ground and $\pm 10V$ bias lines, and 117 V, 60 cycle line to motor. Throw the switch and the Datastrobe is in operation.

is serialized by the Datastrobe's gating logic, actuated by signals from its drum column pickup. As each column comes to the proper position the corresponding 4 bits are supplied to the single decoder-comparator circuit. When the desired number is in the viewing area, a trigger pulse from this circuit fires the single time-shared high speed strobe tube. Due to persistence of vision and the high scanning rate, the complete 6 digit number appears on the screen in parallel as a fixed sharp high contrast flickerless display.

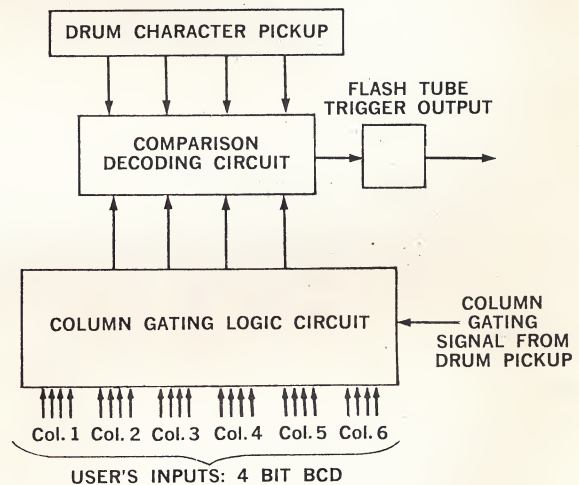


FIG. 2 DATASTROBE LOGIC

decoders, no inverters, no amplifiers nor set pulse signals are required.

a result of Datastrobe's unique time sharing principle, a six column readout has a maximum of only 4 bits energized at any one time. Positive logic modules are also available.

SPECIAL SYSTEMS

Full Alpha-Numeric displays are available on special order. Symbols as well as characters may be displayed. For production quantities substantial economies in circuitry used in conjunction with present readout

RELIABILITY

Reliability is an inherent characteristic of the Datastrobe, as a direct consequence of its simplicity of systems concept. The reliability is further enhanced by conservative design, careful selection of quality components, conservative component application, and a moderate environment. To guarantee compliance with careful manufacturing procedures and ultimately meeting performance specifications is one of the electronic industry's most experienced quality control organizations.

The concept of the system results in utilization of an absolute minimum of components. A single high speed xenon flash tube is time shared over six decades of characters. This single tube replaces either sixty-six incandescent lamps used in an equivalent conventional projection or edge lighted system, or six numeric display tubes of the gas discharge type. Also, the failure mode of the xenon tube is a gradual diminishing of intensity rather than a catastrophic filament burnout as in the incandescent type.

NOTES ON INSTALLATION APPLICATIONS OF DATASTROBE

The Datastrobe system is broken into three modules, two of which are always required, one of which may be part of a customer's equipment. These modules are (1) character generator, (2) electronics logic and (3) the viewing screen unit. The front illustration shows the complete system, consisting of all three of these units assembled. However, the breakdown into the three modules permits a great flexibility in installation and integration in customer equipment. Figure 3 shows the outline dimension of the character generator which is identical for 4 to 6 digits. Figure 4 displays a model which covers 7 to 12 digits. Figures 5 through 8 show various arrangements for the viewing screen unit. Figure 5 shows the outline of the direct rear projection screen system. The length dimension will vary somewhat with character size.

Figures 6 and 7 show outlines of mirror foldback projection systems. The mirror foldback system essentially permits a reduction of the length needed to project the given size number by folding the optical path back on itself, thus reducing the overall length by a significant factor. The foldback forward reflecting system is unique in that it provides extremely wide angle viewing and very high optical efficiency, whereas wide angle viewing in a rear projection screen is obtained at the expense of attenuation. The forward projection screen which is basically a lenticular silver-gray motion

systems are possible through use of special Datastrobe units designed for optimum integration with customer units. Inquiries are invited.

An important result of the time shared logic is a major reduction in the number of electronic components. Typically a six digit Datastrobe will have less than one half the number of transistors, diodes, and resistors required for decoding and driving by other systems.

A secondary favorable effect is the reduction in hardware components, connectors, and sockets. Problems of contact wear, corrosion, and breakage are negligible.

Simplicity in the optical system guarantees trouble free performance. Compared with other types of projection systems, alignment and uniformity of illumination over all numerals does not change with time. This is attributable to use of a single stable glass optical system rather than a multiple plastic lens type.

Rotating components for the character generator incorporate the years of experience and knowledge gained in successful computer drum memory applications. This coupled with conservative application, will deliver well in excess of 10,000 hours performance.

picture screen, eliminates the transmission loss associated with the rear projection screen since it operates by reflection of the light. The lenticular formation of the screen surface provides the wide angle capability. This screen also has the interesting property of being adjustable, so as to permit optimization of reading at longer distances by optimizing the reflection to coincide with the viewing at a distance.

Placement of the electronics module is relatively arbitrary, and adds to the total flexibility of the system. This module may be placed behind, on top, below or alongside of the unit, as in Figure 8.

Where the customer installation is in a console which is well shielded internally from external light, and where the space permits such mounting, the projection screen module may be eliminated. In such case the projection screen and bezel may be mounted directly in the front panel of the customer's console and the rest of the unit mounted at the rear of the console, as in Figure 9. The only space required at the panel itself then, is a space equal to the size of the numbers to be viewed and a clear channel for the projection of the light between the character generator module and the panel.

Thus, the modular versatility of the whole system is clearly demonstrated and many variations can be devised to suit special requirements.

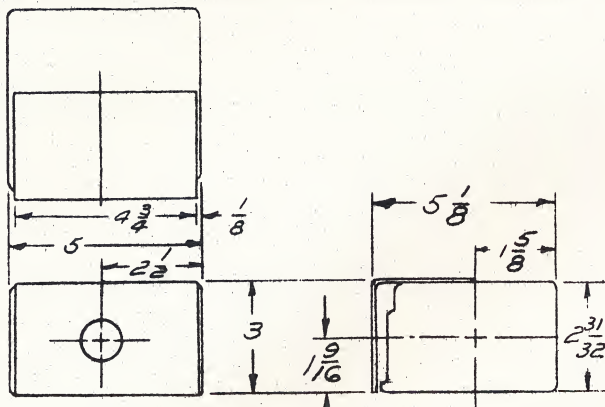


Fig. 3. Character Generator Module. 4-6 Digits.

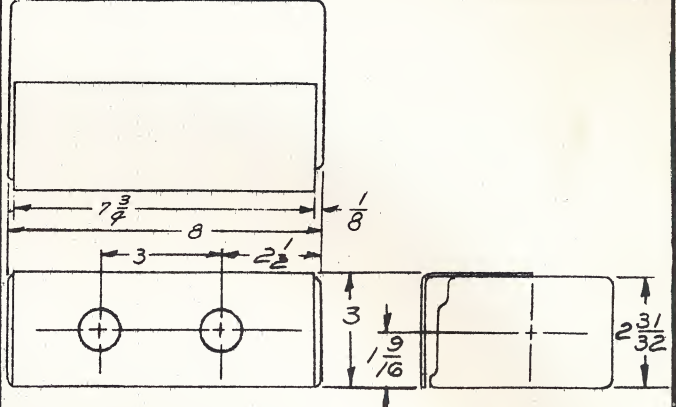


Fig. 4. Character Generator Module. 7-12 Digits.

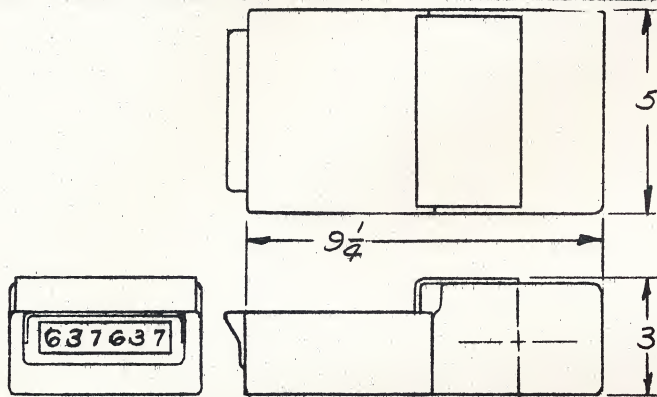


Fig. 5. Complete system with straight line, rear projection viewing scheme.

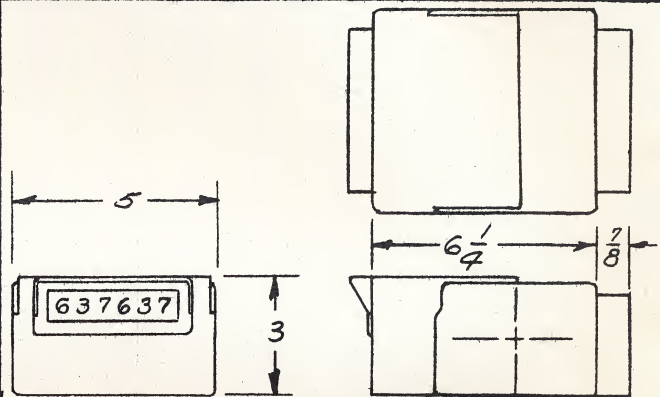


Fig. 6. Complete system with two-mirror foldback optics, rear projection system.

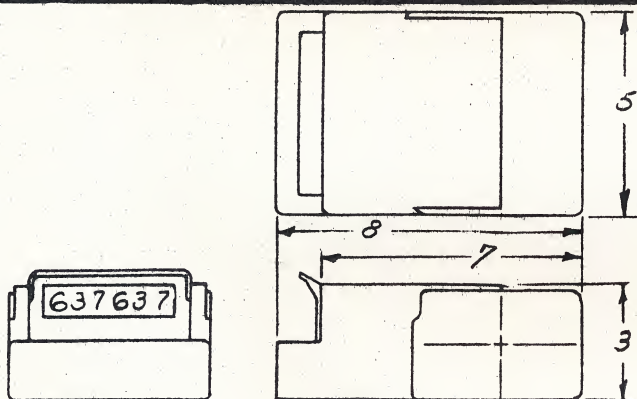


Fig. 7. Complete system with one-mirror foldback optics, front projection system.

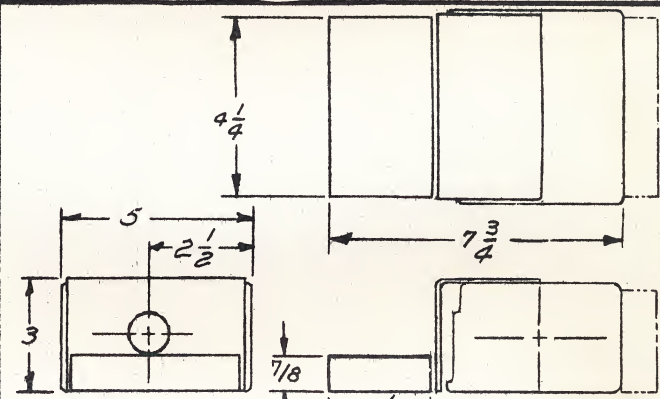


Fig. 8. Character generator and electronics logic module, showing alternate placement.

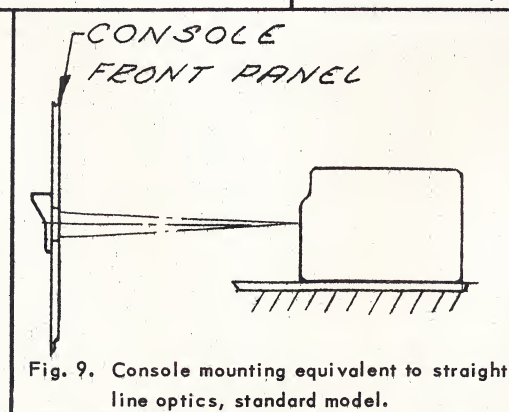
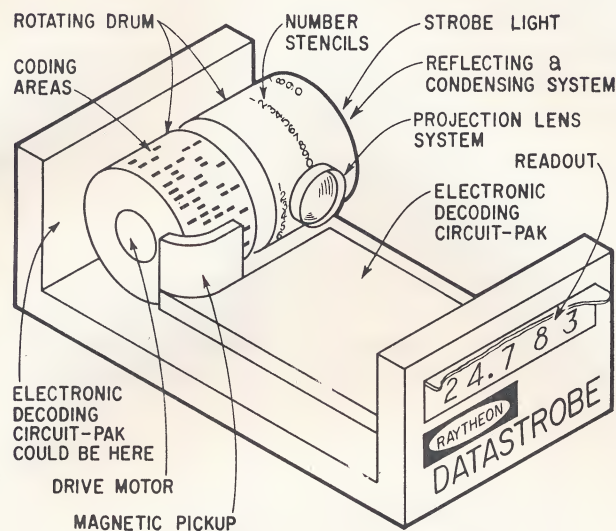


Fig. 9. Console mounting equivalent to straight line optics, standard model.

Now an electronic use of the strobe: display



First production model of the Datastrope has two rotating drums mounted on a single shaft and turning at 2,500 revolutions per minute. The coding columns are on one drum and the readout characters etched into the other.

The **stroboscope**, or speedlight, can make whirring gears and turbine blades stand still for inspection. Now the Raytheon Co. is using the same techniques to generate flickerless displays.

Fewer components, low operating power and high reliability are the result of coupling the stroboscopic principle with time-sharing of electronic circuits in the Datastrope, a new readout device.

The company also sees advantages of simplicity and versatility over other projection readouts and over glow discharge, electroluminescent, electromechanical and edgelighted displays. Datastrope needs no amplifiers, switches, relays or other mechanical devices for intermittent motion. Any type of character or symbol can be etched into the drum. The optics permits printout, including microfilming.

Last fall, Raytheon bought from Norman J. Appleton, a New Jersey inventor, the rights to his stroboscopic readout device. Six months and many market-research hours later, the company will show the first production model at the IEEE show. Some of the engineering has been simplified, but the device is basically the same. Appleton has joined Raytheon and is helping to develop a series of Datastropes, some with memory and printout features.

Datastrope uses rotating drums, a xenon flash lamp; all-solid-state circuits; and an optical projection system, to produce a high-contrast, white-on-black multidigit display from binary coded decimal (BCD) input signals.

The flash tube is surrounded by a continuously rotating cylinder, which has transparent characters on it. The tube replaces as many as 66 incandescent bulbs in conventional project displays.

The readout operates directly from the four-bit BCD input, using a one-volt signal and four milliamps per bit. The basic device can be modified to give full alphanumeric or other symbols in any number of columns. In the first production model, the numbers will be five-eighths of an inch high.

Datastrope's time-shared, all-solid-state logic reduces the number of components. This means increased reliability at lower cost, according to Raytheon's engineers. The decoding system works so that either the correct readout is given or the device fails. "Erroneous readouts are virtually impossible," says a Raytheon design engineer.

In the first production model, two drums are used, one with coding and the other with six columns of characters etched into it. Both drums are mounted on the same shaft, and rotate at 2,500 rpm.

The basic Datastrope accepts up to six columns of parallel, four-bit BCD information directly from the user's output. This information is serialized by the gating logic, actuated by signals from its drum column pickup. As each column comes to the proper position, the corresponding four bits are supplied to the single decoder-comparator circuit. When the desired number is in the viewing area, a trigger pulse from this circuit fires the flash tube. Because of the high scanning rate, the six-digit presentation appears on the screen in parallel as a sharp, high-contrast, flickerless display. The decoder in the

first model uses a reluctance type pickup of voltages in an 8-4-2-1 code.

The time-sharing principle permits low voltage, low current operation. A six-column readout has a maximum of four bits energized at any one time. This time-sharing of a single tube and single decoding logic circuit over all six character-columns reportedly gives advantages in reliability and economics over systems which require a separate decoding matrix per column or a separate strobe tube per column.

The rotating drums, Datastrobe's only mechanical moving parts, require no close speed control, the logic being self-synchronizing. No brushes or rubbing contacts are used, and no gears. The six-digit display is expandable to 12 by putting two drums on a single shaft.

"Everyone seems to want digital readouts today," commented Niles P. Gowell after extensive

market research. "It's just a matter of economics and device engineering." The Datastrobe inherently lends itself to customizing, so prices will vary greatly. A basic Datastrobe, without accessories or special features such as memory, is expected to sell for \$50 to \$60 per character available for readout. Gowell, who is special programs manager for Raytheon's component division, sees the Datastrobe as competitive with any readout device of three digits or more. "The more digits, the more competitive we are," says Gowell.

Applications are being explored in radar range readout, industrial process control, flight control displays, and navigation system readouts. Datastrobe is considered specially attractive for on-the-bridge displays aboard automated ships. Only four bits per digit are required for input, and this significantly reduces the number of wires needed from remote data points.

Specifications

Speed of drum:	2500 rpm
Presentations per second:	45
Input:	110 v 60 cps.
Character height:	Typically 5/8"
Number of digits in display:	5 to 50
Lamp power:	A few watts
Motor power:	A few watts
Over-all dimensions:	9" x 5" x 3" high
Required input:	4 bit BCD
Estimated price:	\$50-\$60 per readout character
Floating decimal point availability	

